REMARKS/ARGUMENTS

Reconsideration of this application and entry of this Amendment are solicited. Claims 1-6 remain active in the application.

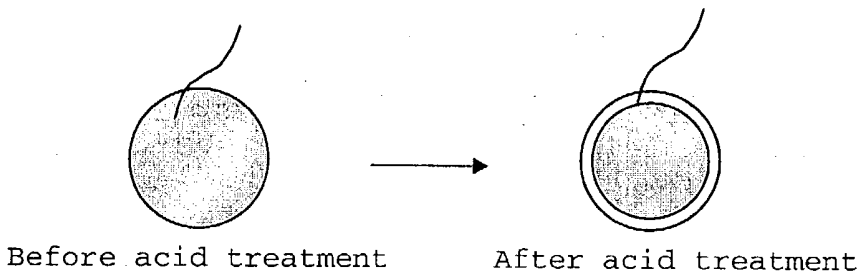
Applicant proposes to amend both independent claims 1 and 6 in order to advance prosecution and reflect further differences as between the subject matter claimed in the present application and the information contained in the cited prior art references, as discussed in more detail below.

More specifically, claims 1 and 6 are amended to replace "comprising" with --consisting essentially of--. This amendment follows the examiner's comments on page 6, lines 10-12. The amendment also makes it clear that applicant's compositions do not include titanium dioxide, a component required by Sproull. *See* also the examiner's comments on page 7, lines 16-19 of the Official Action. In addition, applicant argues the heat resistance of the glass fiber in JPA renders it unacceptable for use in a muffler. An examiner responded arguing that use in a muffler is merely "intended use" and therefore has not been taken into account when assessing patentability. Claims 1 and 6 are also proposed to be amended to include the requirement that the fiber substantially retains its flexibility when heated for ten hours at 900°C which follows the description of heat resistance in test (6) appearing on page 9 of the specification.

Statement Under 37 CFR 1.116(c): The above claim amendments were not earlier proposed as the issues were raised for the first time in the current Official Action.

The sole issue raised in the outstanding Official Action is the continued rejection of claims 1-6 as being unpatentable over Eastes et al U.S. 5,789,329 in view of Sproull U.S. 4,542,106 further in view of JP-A-5-14795 (JPA). The basic rejection is stated in items 2 and 3 of the Official Action. While a detailed response to arguments appears in item 5 of the Official Action, pages 4-8, in some instances the examiner has urged that applicant "lack support" for a certain assertion. It is the object of this response to provide the examiner with relevant information in order to further assess the patentability of the

claims as above amended. On page 5 of the Official Action, the examiner questions applicant's argument that even if the Eastes glass fiber is subjected to acid treatment a discrete surface layer rich in silicon dioxide would not result. With respect, it is submitted that this point has already been addressed in Mr. Tamuro's declaration; *see* item 5 and comparative example 3 where the silicic glass had a thickness of only 0.04 μm and poor heat resistance. To illustrate this point please see the following sketches of cross-sectional structures of the glass fiber of the present invention:



The method of determining the thickness of the surface layer is as follows.

The surface layer after the acid treatment is a porous portion substantially formed of SiO_2, and the fiber of the present invention, after the acid treatment, has the same diameter as that of the fiber before the acid treatment. The thickness of the porous portion formed of SiO_2 is determined as follows.

For this discussion assume that the glass fiber before the acid treatment has a cross-sectional area of 1 (in Example 1, the density of the glass fiber is 2.74), and that the ratio of weight loss (WL) in the acid-treatment glass fiber after heating is 12 % (see Table 1, Example 1, loss ratio after heating 12 %). "Heating" is conducted to remove water included in the porous structure of the acid-treated glass fiber.

Then, since the average density of components other than SiO_2 is estimated to be 3.40, the cross-sectional area after the acid treatment is decreased by 12 x 2.74/3.40 =

9.67 %. That is, the cross-sectional area that remains non-eroded by the acid treatment is an area obtained by deducting the surface layer, and the above cross-sectional area remaining non-eroded is calculated as follows. $1 - 0.0967 = 0.9033$ (when the original cross-sectional area is 1).

Applying this to specific values, when the glass fiber before the acid treatment has a diameter of 13 μm, the diameter of the glass fiber that has not been eroded by the acid treatment can be calculated on the basis of an area ratio, and it is $13 \times (0.9033)^{1/2} = 12.4$ μm. Therefore, the surface layer formed of SiO_2 has a thickness of 0.6 μm. This value is almost equivalent to the thickness of each of glass fibers in Examples 1 to 5 in Table 1 of the present specification.

The thickness of the surface layer after the acid treatment can be represented by the following general expression:

Thickness of surface layer = $D_b \times [1-(1-WL \times 2.74/3.40)^{1/2}]$

D_b : diameter of glass fiber before acid treatment

WL: ratio of weight loss after heating

With regard to other glasses containing different components, the thickness of the surface layer can be calculated on the basis of the density of the original glass and the average density of components that are eluted out.

The glass fiber of Eastes has substantially no discrete surface layer rich in SiO_2. That is because the glass fiber of Eastes having a high SiO_2 content of 59.0 to 61 % is difficult to treat with an acid. This point will be also clear from Comparative Example 3 in Table 2 of the present invention, in which the glass fiber of Comparative Example 3 corresponding to the glass fiber of Eastes has a surface layer having a thickness of 0.04 μm.

Applicant also provides additional information to supplement Table 3 of Mr. Tamura's Declaration of March 14, 2003.

Specifically, with regard to the measurement of heat resistance (90°C, 10 hours) before the acid treatment with regard to Examples 1 to 5 in Table 1 of the present

specification, when the glass fibers in Examples 1 to 5 before the acid treatment were evaluated for heat resistance, all of them showed an evaluation result of C, that is the fibers are fused and deformed. The glass fiber of Eastes has substantially no surface layer formed by the acid treatment, so the heat resistance of the glass fiber of Eastes is readily assumed to be C.

On page 6 of the Official Action, discussion is provided as to the presence (or not) of titanium dioxide as well as "intended use", two issues the examiner raises for consideration. Both of these have been addressed by suitable amendment of the claims and a response as discussed above relating to these claim amendments.

On page 7 of the Official Action, the examiner disputes applicant's comments that prior art fibers are difficult to treat with acid. Again, this was intended to be one of the points established by Mr. Tamura's declaration, however in light of the examiner's comments, further information is now provided.

Both the glass fiber disclosed by Eastes and the glass fiber disclosed by Sproull are difficult to treat with an acid, and it is hence difficult to form a surface layer rich in silica as a surface layer on any of their glass fibers. Even if a surface layer is formed, the thickness of such a surface layer is negligibly small. The reason for this is as follows:

In the glass fiber of Eastes, the glass has an SiO_2 content of 59.0 to 61.0 wt%. There are a variety of components for constituting a glass. Of such components, alkali metal oxides such as Na_2O, K_2O, etc., alkaline earth metal oxides such as CaO, MgO, etc., and Al_2O_3 are all components that can be easily dissolved by a mineral acid such as HCl, HNO_3, or the like. However, SiO_2 is a component that is not at all easily dissolved by these mineral acids. This point is endorsed by a quartz glass formed of only SiO_2, which has remarkably excellent acid resistance and is widely used in various fields that require acid resistance as is well recognized in this art.

Thus when a glass fiber has a high SiO_2 content, the glass fiber itself is difficult to treat with an acid, so that the glass fiber of Eastes having a high SiO_2 content of 59.0 to

61.0 wt% makes it difficult to form a surface layer by the acid treatment, and even if a surface layer is formed, the thickness of such a surface layer is negligibly small.

Consider also the glass fiber of Sproull which has a TiO_2 content of 1 to 5 wt%. Of the glass components, like SiO_2, TiO_2 is a component that cannot at all be easily dissolved by the above mineral acids as is well recognized in this art.

Thus when a glass fiber contains TiO_2, the glass fiber itself is difficult to treat with an acid, so that with Sproull's glass fiber the presence of TiO_2 makes it difficult to form a surface layer, and even if a surface layer is formed, the thickness of such a surface layer is negligibly small.

In contrast, the glass fiber of the present invention has an SiO_2 content of 56 to 58.5 wt%, which is less than the SiO_2 content of 59.0 to 61.0 wt% of the glass fiber of Eastes. Differing from the glass fiber of Sproull, the glass fiber of the present invention contains no TiO_2 as the amended claims reflect. Further, as the present invention also defines the contents of the other components, Al_2O_3, CaO, MgO, Na_2O and K_2O, which can be easily dissolved by a mineral acid, the present invention therefore enables, by the acid treatment, easier formation of a surface layer that is rich in SiO_2 and has a significant thickness.

For the above reasons counsel submits that applicant has fully addressed the issues raised by the examiner in the current Official Action by suitable amendment of the claims and/or relevant information demonstrating that these claims are inventive. Reconsideration, entry of this Amendment and favorable action are solicited. The examiner is advised that a Notice of Appeal was filed on February 9, 2004 to maintain pendency of the application until this Amendment and Response can be fully considered and processed by the examiner.

Respectfully submitted,

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